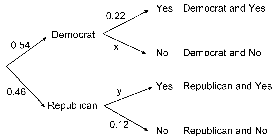
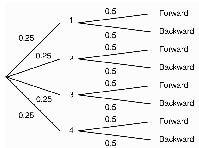
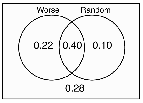
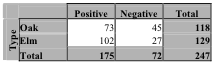
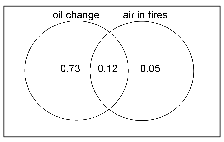
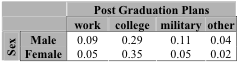
Name: KEY

Date:

**Multiple Choice (2pts each)**

1. Which events are disjoint?
   1. Rolling an odd number on a die and rolling a 5 on a die
   2. **Rolling a 3 on a die and rolling an even number on a die**
   3. Graduating from high school and being accepted into college
   4. Graduating from high school and playing an instrument
2. Which events are probably independent?
   1. Graduating from high school and being accepted into college
   2. Getting an odd number and a 5 on one roll of a die
   3. Drawing a red M&M candy from a package and then drawing a green M&M
   4. **Winning a swim meet and winning the lottery**
3. 57% of the senior class is female. Of the females, 14% are school athletes. What is the probability that a senior selected at random is a female school athlete?
   1. 8.1%
   2. 4.1%
   3. 6.9%
   4. not possible; gender and athletic status are disjoint events
4. Here is a partially finished tree diagram showing the political parties of local government officials and how they are expected to vote on a upcoming issue.   
     
   Which probability is represented by **x** on the diagram?
   1. The probability of no votes being cast
   2. **The probability that a Democrat votes no**
   3. The probability that no vote was cast by a Democrat
   4. The probability that a vote is from a Democrat and is no.
5. Using the diagram in question 4, find these probabilities: (2pts each)
   1. *x* **0.78**
   2. *y* **0.88**
   3. P(No) **0.4764**
   4. P(No and Republican) **0.0553**
   5. P(No or Republican) **0.8812**
   6. P(No | Republican) **0.12**
6. Label each pair of events as **disjoint**, **independent**, or **neither**, then **justify** you choice.
   1. A traffic light is red. At the same time, there is a car at this intersection with its headlights on. **Independent** (1pt)  
        
      Justify: (3pts)  
      **One event has nothing to do with the other. The fact that the light is red has no effect on whether or not a car has its headlights on.**
   2. A traffic light is green. At the same time, the traffic light for cross traffic is also green. **Disjoint** (1pt)  
        
      Justify: (3pts)  
      **These two events cannot occur at the same time. Therefore, they are disjoint.**
   3. A traffic light is red. At the same time, there is a car stopped at the intersection. **Neither** (1pt)  
        
      Justify: (3pts)  
      **These events are not independent because if the light is red, we know that if there is a car at the intersection, it will be stopped. The fact that the light is red tells us whether or not the car will be stopped. Also, these two events do occur at the same time, so they are not disjoint.**
7. Brianna is using the two spinners shown below to play her new board game. She spins the arrow on each spinner once. Brianna uses the first spinner to determine how many spaces to move. She spins the arrow on each spinner once. Brianna uses the first spinner to determine how many spaces to move. She uses the second spinner to determine whether her move from the first spinner will be forward or backward.  
   
   1. Draw a fully labeled tree diagram to show the possible outcomes from spinning each spinner once. (3pts)  
      
   2. What is the probability that Briana spins 3 spaces backward? (3pts)  
        
        
      **0.125**
   3. What is the probability that Briana moves forward? (3pts)  
        
        
        
      **0.125 + 0.125 + 0.125 + 0.125 = 0.5**
   4. Briana needs to move at least 2 spaces forward to get ahead of her opponent. What is the probability that this will happen on her next spin? (3pts)  
        
      **0.125 + 0.125 + 0.125 = 0.375**
8. In polls published by Rasmussen Reports in September 2010, 62% of likely U.S. voters believe that no matter how bad things are, Congress can always make them worse and 50% believe “a group randomly selected from the phone book could do as good a job as the current Congress.” Suppose 40% agree with both of these statements. What is the probability that likely U.S. voters agree with one statement or the other? (3pts)  
    **0.22 + 0.40 + 0.10 = 0.72**
9. An experiment tested a tree fertilizer on a large number of elm and oak trees to see whether it promoted positive changes such as growth, less brownage, or increased foliage. Below is a summary of the data collected in the experiment.  
     
   1. What would it mean for the effect of this fertilizer to be independent of the type of tree? (3pts)  
        
      **It would mean that the type of tree would have no effect on the effect of the fertilizer**
   2. Do the data suggest effect (positive/negative) and tree type are independent? Explain. (3pts)  
      **No. Effect and tree type are not independent. The percent of oak trees that have a positive effect is 73/118 = 0.6186. The overall percent of trees that have a positive effect is 175/247 = 0.7085.**
10. 85% of cars brought to Sam’s Garage need an oil change. Of those cars, 42% also need an additional repair or service. What is the probability that a car brought to Sam’s Garage needs both and oil change and an additional repair or service? **Show your work.** (3pts)  
    **(0.85)(0.42) = 0.357**
11. The Venn diagram at right shows the   
    percentages of cars at Sam’s Garage that   
    need an oil change or air in the tires.   
    **Show your work.**
    1. What is the probability that a car needs air in its tires? **0.17**   
       (2pts)  
       **0.12 + 0.05**
    2. What is the probability that a car needs an oil change **or** air? **0.9**   
       (2pts)  
         
         
       **0.73 + 0.12 + 0.05**
    3. What is the probability that a car needs an oil change **and** air? **0.12**   
       (2pts)
    4. What is the probability that a car needs neither an oil **0.1**   
       change nor air?  
       (2pts)  
         
         
       **1 – (0.73 + 0.12 + 0.05)**
    5. Are needing an oil change and needing air mutually **No**   
       exclusive events? (1pt)   
         
       Explain why or why not. (2pts)  
         
       **There are some cars (12%) that need both.**
12. The table shows the plans of a group of high school seniors. **Show your work**.   
      
    1. What is the probability that a senior plans to join **0.16**   
       the military? (2pts)  
         
       **0.11 + 0.05**
    2. What is the probability that a senior plans to join **0.1064**   
       the military given the student is female? (2pts)   
         
       **0.05 / 0.47**
    3. What is the probability that a senior is female **0.3125**   
       given that the senior plans to join the military? (2pts)   
         
       **0.05 / 0.16**
    4. Explain what it would mean if the sex and post-graduate plans of seniors are independent. (2pts)  
         
       **If sex and plans of seniors after graduation were independent, then one would not affect the other, and the probability to choose a plan would be the same for males, females, and the total population.**
    5. Based on the table, does it appear that a senior’s **No**   
       post-graduation plans are independent of the person’s sex? (2pts)   
       Justify your answer. (2pts)  
       **The probability that someone plans to join the military is 0.16, while the probability that a female plans to join the military is 0.1064. If plans were independent of sex, these would be the same.**
13. In one version of a dice game called “Pig” players repeatedly roll a regular six-sided die, adding each number rolled to their score. Players may keep rolling as many times as they want to try to improve their score, but if they roll a 1, they lose all the points earned during that round.  
    1. What is the probability of rolling a 1 on your first roll? **0.167**   
       (2pts)  
         
       **1/6**
    2. What is the probability of not rolling a 1 until the second roll? **0.1389**   
       (2pts)  
         
       
    3. What is the probability of rolling your first 1 on your **0.3056**   
       1st or 2nd roll? (2pts)  
         
       